OFFICIAL JOURNAL OF THE INTERNATIONAL SOCIETY OF CHEMICAL ECOLOGY Volume 16, 1990

Journal of Chemical Ecology is devoted to promoting an ecological understanding of the origin, function, and significance of natural chemicals that mediate interactions within and between organisms. Such relationships, often adaptively important, comprise the oldest of communication systems in terrestrial and aquatic environments. With recent advances in methodology for elucidating structures of the chemical compounds involved, a strong interdisciplinary association has developed between chemists and biologists which should accelerate understanding of these interactions in nature.

Scientific contributions, including review articles, are welcome from either members or nonmembers of the International Society of Chemical Ecology. Manuscripts must be in English and may include original research in biological and/or chemical aspects of chemical ecology. They may include substantive observations of interactions in nature, the elucidation of the chemical compounds involved, the mechanisms of their production and reception, and the translation of such basic information into survey and control protocols. Sufficient biological and chemical detail should be given to substantiate conclusions and to permit results to be evaluated and reproduced.

Letters to the Editor provide an opportunity for opinion, discussion, and rebuttal.

Robert M. Silverstein Department of Chemistry College of Environmental Science and Forestry State University of New York Syracuse, New York

John B. Simeone

Department of Environmental and Forest Biology College of Environmental Science and Forestry State University of New York Syracuse, New York

EDITORIAL BOARD

Thomas C. Baker, University of California, Riverside, California May R. Berenbaum, University of Illinois, Urbana, Illinois Gunnar Bergström, University of Göteborg, Göteborg, Sweden Elizabeth A. Bernays, University of California, Berkeley Martin C. Birch, Oxford University, Oxford, England Murray S. Blum, The University of Georgia, Athens, Georgia

John H. Borden, Simon Fraser University, Burnaby, B. C., Canada William S. Bowers, University of Arizona, Tucson, Arizona Lincoln P. Brower, University of Florida, Gainesville, Florida Gordon M. Burghardt, University of Tennessee, Knoxville, Tennessee Wendell E. Burkholder, University of Wisconsin, Madison, Wisconsin Ring T. Cardé, University of Massachusetts, Amherst, Massachusetts Thomas Eisner, Cornell University, Ithaca, New York Wittko Francke, University of Hamburg, Hamburg, West Germany Michael M. Martin, The University of Michigan, Ann Arbor, Michigan

Jerrold Meinwald, Cornell University, Ithaca, New York
Dietland Müller-Schwarze, State University of New York College of Environmental Science and Forestry, Syracuse,

New York

Yoko Naya, Suntory Institute for Bioorganic Research, Osaka, Japan Jacques M. Pasteels, Université Libre de Bruxelles, Bruxelles, Belgium

B.J.R. Philogène, University of Ottawa, Ottawa, Canada

Glenn D. Prestwich, State University of New York, Stony Brook, New York

Ronald J. Prokopy, University of Massachusetts, Amherst, Massachusetts

Elroy L. Rice, The University of Oklahoma, Norman, Oklahoma

Richard L. Ridgway, USDA-SEA-ARS-BARC, Beltsville, Maryland

Wendell L. Roelofs, New York State Agricultural Experiment Station, Geneva, New York Dietrich Schneider, Max-Planck-Institut für Verhaltensphysiologie, Seewiesen, Republic of Germany Nancy M. Targett, University of Delaware, Lewes, Delaware

James H. Tumlinson, USDA-ARS-SR, Insect Attractants and Basic Biology Laboratory, Gainesville, Florida

S. B. Vinson, Texas A&M University, College Station, Texas

Iain Weatherston, Sault St. Marie, Ontario, Canada

David L. Wood, University of California, Berkeley, California

Journal of Chemical Ecology is published monthly by Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. Subscription orders should be addressed to the publisher. Advertising inquiries should be addressed to the Advertising Sales Representative, Daniel S. Lipner, Weston Media Associates, P.O. Box 1110, Greens Farms, Connecticut 06436 - telephone (203) 261-2500 and fax (203) 261-0101. Journal of Chemical Ecology is abstracted or indexed in Biological Abstracts, Chemical Abstracts, Current Contents, Energy Research Abstracts, Field Crop Abstracts, Herbage Abstracts, Referativnyi Zhurnal, and Wildlife Research. @1990 Plenum Publishing Corporation. Journal of Chemical Ecology participates in the Copyright Clearance Center (CCC) Transactional Reporting Service. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the flat fee of \$6.00 per copy per article (no additional per-page fees) directly to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, Massachusetts 01970, for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. The CCC is a nonprofit clearinghouse for the payment of photocopying fees by libraries and other users registered with the CCC. Therefore, this consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables, and text excerpts. 0098-0331/90 \$6.00

Volume 16, 1990 (12 issues) \$495.00 (outside the U.S., \$575.00). Price for individual subscribers certifying that the journal

is for their personal use, \$99.50 (outside the U.S., \$120.00).

Volume 17, 1991 (12 issues) \$535.00 (outside the U.S., \$625.00). Price for individual subscribers certifying that the journal is for their personal use, \$115.00 (outside the U.S., \$135.00).

Second-class postage paid at New York, N.Y., and at additional mailing offices. Postmaster: Send address changes to Journal of Chemical Ecology, Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013.

Printed in the USA.

Journal of Chemical Ecology is published monthly by Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. Subscription orders should be addressed to the publisher. Advertising inquiries should be addressed to the Advertising Sales Representative, Daniel S. Lipner, Weston Media Associates, P.O. Box 1110, Greens Farms, Connecticut 06436-telephone: (203) 261-2500 and fax (203) 261-0101. Journal of Chemical Ecology is abstracted or indexed in Biological Abstracts, Chemical Abstracts, Current Contents, Energy Research Abstracts, Field Crop Abstracts, Herbage Abstracts, Referativnyi Zhurnal, and Wildlife Research. © 1990 Plenum Publishing Corporation. Journal of Chemical Ecology participates in the Copyright Clearance Center (CCC) Transactional Reporting Service. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the flat fee of \$6.00 per copy per article (no additional per-page fees) directly to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, Massachusetts 01970, for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. The CCC is a nonprofit clearinghouse for the payment of photocopying fees by libraries and other users registered with the CCC. Therefore, this consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables, and text excerpts. 0098-0331/90 \$6.00

Volume 16, Number 1

January 1990

CONTENTS

Special Issue: Fifth Annual Meeting of the International Society of Chemical Ecology

| INTRODUCTION | 1 |
|---|-----|
| Analysis of Gular and Paracloacal Gland Secretions of the American Alligator (Alligator mississippiensis) by Thin-Layer Chromatography: Gland, Sex, and Individual Differences in Lipid Components PAUL J. WELDON, TIMOTHY P. SCOTT, and MICHAEL J. TANNER | 3 |
| Chemical Properties of Femoral Gland Secretions in the Desert Iguana, Dipsosaurus dorsalis Allison C. Alberts | 13 |
| Sex Recognition in the Leopard Gecko, <i>Eublepharis macularius</i> (Sauria: Gekkonidae): Possible Mediation by Skin-Derived Semiochemicals ROBERT T. MASON and WILLIAM H.N. GUTZKE | 27 |
| Responses by Corn Snakes (<i>Elaphe guttata</i>) to Chemicals from Heterospecific Snakes Paul J. Weldon, Neil B. Ford, and Janice J. Perry-Richardson | 37 |
| A Comparative Analysis of Scoring Methods for Chemical Discrimination of Prey by Squamate Reptiles WILLIAM E. COOPER, JR. and GORDON M. BURGHARDT | 45 |
| Analysis of Chemicals from Earthworms and Fish That Elicit Prey Attack by Ingestively Naive Garter Snakes (<i>Thamnophis</i>) Fred M. Schell, Gordon M. Burghardt, Adam Johnston, and Christopher Coholich | 67 |
| Chemical Cues Used by Prairie Rattlesnakes (<i>Crotalus viridis</i>) to Follow Trails of Rodent Prey David Chiszar, Ted Melcer, Robert Lee, Charles W. Radcliffe, and David Duvall | 79 |
| Chemical and Behavioral Ecology of Foraging in Prairie Rattlesnakes (Crotalus viridis viridis) DAVID DUVALL, DAVID CHISZAR, WILLIAM K. HAYES, JANET K. LEONHARDT, and MATTHEW J. GOODE | 87 |
| Vomerolfaction and Vomodor WILLIAM E. COOPER, JR. and GORDON M. BURGHARDT | 103 |

| Metabolism and Excretion of Furanocoumarin Xanthotoxin by Parsnip Webworm, *Depressaria pastinacella* James K. Nitao | 417 |
|---|-----|
| Andrena wilkella Male Bees Discriminate Between Enantiomers of Cephalic Secretion Components JAN TENGÖ, LENNART ÅGREN, BRUNO BAUR, ROLAND ISAKSSON, TOMMY LILJEFORS, KENJI MORI, WILFRIED KÖNIG, and WITTKO FRANCKE | 429 |
| Impact of Atmospheric Pollution on Linear Furanocoumarin Content in Celery WILHELM DERCKS, JOHN TRUMBLE, and CARL WINTER | 443 |
| Inhibition of Cucumber Leaf Expansion by Ferulic Acid in Split-Root Experiments Kristofer Klein and Udo Blum | 455 |
| Attraction of Oryzaephilus surinamensis (L.) and Oryzaephilus mercator (Fauvel) (Coleoptera: Cucujidae) to Some Common Volatiles of Food A. M. PIERCE, H. D. PIERCE, JR., A. C. OEHLSCHLAGER, and J. H. BORDEN | 465 |
| Apple Ermine Moth, Yponomeuta malinellus Zeller: Two Components of Female Sex Pheromone Gland Highly Effective in Field Trapping Tests L. M. McDonough, H. G. Davis, C. L. Smithhisler, S. Voerman, and P. S. Chapman | 477 |
| Sucrose Esters of Carboxylic Acids in Glandular Trichomes of Solanum berthaultii Deter Settling and Probing by Green Peach Aphid JONATHAN J. NEAL, WARD M. TINGEY, and JOHN C. STEFFENS | 487 |
| Response of Parasitoid <i>Eucelatoria bryani</i> to Selected Plant Material in an Olfactometer W. R. Martin, Jr., Donald A. Nordlund, and William C. Nettles, Jr. | 499 |
| Interpopulational Variation in Emitted Pheromone Blend of Cabbage Looper Moth, *Trichoplusia ni* K. F. Haynes and R. E. Hunt | 509 |
| A Kairomone for <i>Trichogramma nubilale</i> (Hymenoptera: Trichogrammatidae): Isolation, Identification, and Synthesis SHENGQIANG SHU, PAUL D. SWEDENBORG, and RICHARD L. JONES | 521 |
| Variability in Pheromone Composition and Periodicity of Pheromone Titer in Potato Tuberworm Moth, <i>Phthorimaea operculella</i> (Lepidoptera: Gelechiidae) T. ONO, R. E. CHARLTON, and R. T. CARDÉ | 531 |
| Courtship Pheromone Production and Body Size as Correlates of Larval Diet in Males of Arctiid Moth, <i>Utetheisa ornatrix</i> W. E. CONNER, B. ROACH, E. BENEDICT, J. MEINWALD, and T. EISNER | 543 |
| Biology of Pheromone Release by Male Caribbean Fruit Flies, Anastrepha suspensa (Diptera: Tephritidae) JAMES L. NATION | 553 |
| Effects of Predator Fecal Odors on Feed Selection By Sheep and Cattle JAMES A. PFISTER, DIETLAND MÜLLER-SCHWARZE, and DAVID F. BALPH | 573 |
| Repellency of Volatile Fatty Acids Present in Frass of Larval Yellow Mealworms, *Tenebrio molitor* L. (Coleoptera: Tenebrionidae), To Larval Conspecifics *DAVID K. WEAVER, J. E. MCFARLANE, and I. ALLI. | 585 |

| Suppression of Oviposition in <i>Oryzaephilus surinamensis</i> (L.) (Coleoptera: Cucujidae) Following Prolonged Retention in High-Density Cultures or Short-Term | |
|---|-----|
| Exposure to Larval Volatiles | 595 |
| A. M. PIERCE, J. H. BORDEN and A. C. OEHLSCHLAGER | |
| Field Test of Pheromone Hypothesis for Homing by Pacific Salmon ERNEST L. BRANNON and THOMAS P. QUINN | 603 |
| Responses to Inter- and Intraspecific Scent Marks in Pine Martens (Martes martes) Michele de Monte and Jean-Jacques Roeder | 611 |
| Soldier Defense Secretions of Malaysian Free-Ranging Termite of the Genus Lacessititermes (Isoptera, Nasutitermitinae) S. H. Goh, C. H. Chuah, J. Vadiveloo, and Y. P. Tho | 619 |
| Robber Bees (Lestrimelitta limao) and Their Host: Chemical and Visual Cues in Nest Defense by Trigona (Tetragonisca) angustula (Apidae: Meliponinae) DIETER WITTMANN, RAINER RADTKE, JOCHEN ZEIL, GUNTHER LÜBKE, and WITTKO FRANCKE | 631 |
| GUEST EDITORIAL THOMAS FISHER and JERROLD MEINWALD | 643 |

Volume 16, Number 3

March 1990

| ~ | 0 | N | T | T | N | T | C |
|---|---|-----|---|---|---|---|---|
| | v | 7.4 | | | T | | |

| Volatile Seed Germination Inhibitors from Plant Residues JUDITH M. BRADOW and WILLIAM J. CONNICK, JR. | 645 |
|--|-----|
| Structure-Activity Relationships for Chain-Shortened Analogs of (Z)-5-Decenyl Acetate, a Pheromone Component of the Turnip Moth, Agrotis segetum MARIE BENGTSSON, TOMMY LILJEFORS, BILL S. HANSSON, CHRISTER LÖFSTEDT, and SYLVIA V. COPAJA | 667 |
| Chemical Defense Secretions of Some Species of Malaysian Rhinotermitidae (Isoptera, Rhinotermitidae) С.Н. СНИАН, S.H. GOH, and Y.P. ТНО | 685 |
| Dermatitis-Inducing Furanocoumarins on Leaf Surfaces of Eight Species of Rutaceous and Umbelliferous Plants ALICJA M. ZOBEL and STEWART A. BROWN | 693 |
| Sunflower Aroma Detection by the Honeybee: Study by Coupling Gas Chromatography and Electroantennography Denis Thiery, Jean Manuel Bluet, Minh-Ha Pham-Delègue, Patrick Etiévant, and Claudine Masson | 701 |
| Odor Volatiles Associated With Mite-Infested Bin-Stored Wheat D. Tuma, R.N. Sinha, W.E. Muir, and D. Abramson | 713 |
| Antibiotic Properties of Porcupine Quills ULDIS ROZE, DAVID C. LOCKE, and NICK VATAKIS | 725 |
| Branch-Cutting Behavior by the Vole (<i>Microtus pennsylvanicus</i>): A Mechanism to Decrease Toxicity of Secondary Metabolites in Conifers JACQUELINE ROY and JEAN-MARIE BERGERON | 735 |
| A New Sarpedobilin-Containing Butterfly: Papilio graphium stresemani stresemani and its Bioecological Situation Within the Species MICHEL BARBIER | 743 |
| Behavioral Response of Male White Peach Scale to the Sex Pheromone, (R, Z)-3,9-Dimethyl-6-Isopropenyl-3,9-Decadien-1-Ol Propionate and the Corresponding Alcohol J.R. McLaughlin | 749 |
| Possible Roles of Cotton Bud Sugars and Terpenoids in Oviposition by the Boll Weevil PAUL A. HEDIN and JACK C. McCarty | 757 |
| Male European Corn Borer, Ostrinia nubilalis (Hübner), Antennal Responses to Analogs of Its Sex Pheromone: Strain, Electroantennogram, and Behavior Relationships Howard W. Fescemyer and Frank E. Hanson | 773 |
| Antifouling Agents from Marine Sponge Lissodendoryx isodictyalis Carter Margaret A. Sears, Donald J. Gerhart, and Dan Rittschof | 791 |
| Role of Phenolics of Coniferous Trees as Deterrents Against Debarking Behavior of Meadow Voles (Microtus pennsylvanicus) JACQUELINE ROY and JEAN-MARIE BERGERON | 801 |
| Effect of Steam Distillate Extract of Resistant Wild Rice Oryza officinalis on Behavior of Brown Planthopper Nilaparvata lugens (Stal) (Homoptera: Delphacidae) R. Velusamy, B. Thayumanavan, S. Sadasivam, and S. Jayaraj | 809 |

| Identification and Synthesis of Insect Pheromone. XXVIII. Sex Pheromone of Poplar Pole Clearwing Moth, Sphecia siningensis Hsu Guo Guangzhong, Li Zhenyu, Lin Guoqiang, Wu Peiheng, Zhang Xuehai, Liu Hanqian, and Yang Xueyan | 819 |
|--|-----|
| Chemical and Behavioral Studies on Dufour Gland Contents of Manica rubida (Hymenoptera: Formicidae) BRIAN D. JACKSON, MARIE-CLAIRE CAMMAERTS, E. DAVID MORGAN, and ATHULA B. ATTYGALLE | 827 |
| Honeybee Response to Queen Mandibular Pheromone in Laboratory Bioassays LORI-ANN KAMINSKI, KEITH N. SLESSOR, MARK L. WINSTON, NAIRN W. HAY, and JOHN H. BORDEN | 841 |
| Semiochemicals of the Honeybee Queen Mandibular Glands KEITH N. SLESSOR, LORI-ANN KAMINSKI, G.G.S. KING, and MARK L. WINSTON | 851 |
| Isolation of Pheromone Synergists of Bark Beetle, Pityogenes chalcographus, from Complex Insect-Plant Odors by Fractionation and Subtractive-Combination Bioassay JOHN A. BYERS, GÖRAN BIRGERSSON, JAN LÖFQVIST, MONICA APPELGREN, and GUNNAR BERGSTRÖM | 861 |
| Effects of Mite Resistance Mechanism of Geraniums on Mortality and Behavior of Foxglove Aphid (Acyrthosiphon solani Kaltenbach) Donald S. Walters, Richard Craig, and Ralph O. Mumma | 877 |
| Compound Interactions: Effects of Plant Antioxidants in Combination with Carbaryl on Performance of <i>Trichoplusia ni</i> (Cabbage Looper) A. GONZALEZ-COLOMA, C.S. WISDOM, and P.W. RUNDEL | 887 |
| Effects of Ferulic Acid on Glomus fasciculatum and Associated Effects on Phosphorus Uptake and Growth of Asparagus (Asparagus officinalis L.) TRACY L. WACKER, GENE R. SAFIR, and CHRISTINE T. STEPHENS | 901 |
| Chemically Induced Metamorphosis of Polychaete Larvae in Both the Laboratory and Ocean Environment REBECCA A. JENSEN and DANIEL E. MORSE | 911 |
| Allelopathy of Small Everlasting (Antennaria microphylla): Phytotoxicity to Leafy Spurge (Euphorbia esula) in Tissue Culture MARY ELLEN HOGAN and GARY D. MANNERS | 931 |
| Response of Pocket Gophers (<i>Thomomys talpoides</i>) to an Operational Application of Synthetic Semiochemicals of Stoat (<i>Mustela erminea</i>) THOMAS P. SULLIVAN, DOUGLAS R. CRUMP, HAL WIESER, and ELISABETH A. DIXON | 941 |
| Comparison of Release Devices for Stoat (Mustela erminea) Semiochemicals Used as Montane Vole (Microtus montanus) Repellents THOMAS P. SULLIVAN, DOUGLAS R. CRUMP, HAL WIESER, and ELISABETH A. DIXON | 951 |
| Calling Behavior of Almond Moth (Ephestia cautella) Females Kept in Glass Cages and Airborne Pheromone Deposited on Glass Surfaces by Airstream Arnon Shani | 959 |
| Air Sampling of Volatile Sex Pheromone Components in a Closed Jar ARNON SHANI | 971 |
| Phytohormone Ecology: Herbivory by <i>Thrips tabaci</i> Induces Greater Ethylene Production in Intact Onions than Mechanical Damage Alone Deborah M. Kendall and Louis B. Biostad | 981 |

Volume 16, Number 4

April 1990

| Bark Beetles (Coleoptera: Scolytidae) James H. Cane, David L. Wood, and Joseph W. Fox | 993 |
|--|------|
| Aggregation Pheromone of Driedfruit Beetle, Carpophilus hemipterus: Wind-Tunnel Bioassay and Identification of Two Novel Tetraene Hydrocarbons ROBERT J. BARTELT, PATRICK F. DOWD, RONALD D. PLATTNER, and DAVID WEISLEDER | 1015 |
| Release Rates of Tetradecen-1-ol Acetates from Polymeric Formulations in Relation to Temperature and Air Velocity C. VAN DER KRAAN and A. EBBERS | 1041 |
| Isolation and Identification of Oviposition Deterrents to Cabbage Butterfly, <i>Pieris rapae</i> , from <i>Erysimum cheiranthoides</i> K. SACHDEV-GUPTA, J.A.A. RENWICK, and C.D. RADKE | 1059 |
| Exocrine Secretions of Bees. X. 3,7-Dimethyldeca-2,6-dien-1,10-diol: A Sex-Specific Compound from <i>Nomada annulata</i> (Hymenoptera: Anthophoridae) R.M. Duffield, C. Simon-Jordan, E.W. Riddick, and J.W. Wheeler | 1069 |
| Coniferyl Benzoate in Quaking Aspen: A Ruffed Grouse Feeding Deterrent WALTER J. JAKUBAS and GORDON W. GULLION | 1077 |
| Diversity in Digestive Proteinase Activity among Insects JANE L. WOLFSON and LARRY L. MURDOCK | 1089 |
| Mandelonitrile in Larval Secretion of Mountain Ash Sawfly, <i>Pristiphora geniculata</i> (Hymenoptera: Tenthredinidae) R.M. Duffield, A. Shafagati, E.W. Riddick, S. Bowen, and J.W. Wheeler | 1103 |
| Seasonal Patterns of Juglone in Soil Beneath <i>Juglans nigra</i> (Black Walnut) and Influence of <i>J. nigra</i> on Understory Vegetation BETTINA DE SCISCIOLO, DONALD J. LEOPOLD, and DANIEL C. WALTON | 1111 |
| Sex Pheromone of <i>Manduca sexta</i> (L): Stereoselective Synthesis of (10 <i>E</i> ,12 <i>E</i> ,14 <i>Z</i>)-10,12,14-Hexadecatrienal and Isomers R.E. DOOLITTLE, A. BRABHAM, and J.H. TUMLINSON | 1131 |
| Inhibitory Pheromonal Activity Promoted by Sulfur Analogs of the Sex Pheromone of the Female Processionary Moth <i>Thaumetopoea pityocampa</i> (Denis and Schiff) FRANCISCO CAMPS, VICENS GASOL, and ANGEL GUERRERO | 1155 |

| Cuticular Hydrocarbons of Eight Species of North American Cone Beetles, Conophthorus Hopkins Marion Page, Lori J. Nelson, Michael I. Haverty, and Gary J. Blomquist | 1173 |
|--|------|
| Strong Repellency of the Root Knot Nematode, <i>Meloidogyne incognita</i> by Specific Inorganic Ions C.E. CASTRO, N.O. BELSER, H.E. MCKINNEY, and I.J. THOMASON | 1199 |
| Chemical Communication in the Dacetine Ant <i>Daceton armigerum</i> (Hymenoptera: Formicidae) BERT HÖLLDOBLER, JACQUELINE M. PALMER, and MARK W. MOFFETT | 1207 |
| Inactivation of Baculovirus by Quinones Formed in Insect-Damaged Plant Tissues GARY W. FELTON and SEAN S. DUFFEY | 1221 |
| Female-Produced Oviposition Deterrents of the Cigarette Beetle, Lasioderma serricorne (F.) (Coleoptera: Anobiidae) Toshihiro Imai, Hisashi Kodama, Tatsuji Chuman, and Masahiro Kohno | 1237 |
| A Mutation in Pheromonal Communication System of Cabbage Looper Moth, Trichoplusia ni Kenneth F. Haynes and Randy E. Hunt | 1249 |
| Effect of Release Rate and Ratio of (Z)-11-Hexadecen-1-ol from Synthetic Pheromone Blends on Trap Capture of Heliothis subflexa (Lepidoptera: Noctuidae) R.R. HEATH, E.R. MITCHELL, and J. CIBRIAN TOVAR | 1259 |
| Chemosensory Responses of Cowpea Weevil, Callosobruchus chinensis to an Aquatic Weed, Water Hyacinth, Eichhornia crassipes (Mart) Solms USHA RANI and KAISER JAMIL | 1269 |
| Sex Attraction in Paper Wasp, <i>Polistes exclamans</i> Viereck (Hymenoptera: Vespidae), in a Wind Tunnel H.C. REED and P.J. LANDOLT | 1277 |
| Compounds Modifying Male Responsiveness to Main Female Sex Pheromone Component of the Currant Borer, Synanthedon tipuliformis Clerk (Lepidoptera: Sesiidae) under Field Conditions G. SZÖCS, L.A. MILLER, W. THOMAS, R.A. VICKERS, G.H.L. ROTHSCHILD, M. SCHWARZ, and M. TOTH | 1289 |
| Limonene Inhibits Attraction to α-Pinene in Pine Weevils Hylobius abietis and H. pinastri GÖRAN NORDLANDER | 1307 |
| Antennal Olfactory Responses of Black Turpentine Beetle, <i>Dendroctonus terebrans</i> (Olivier), to Bark Beetle Pheromones and Host Terpenes J.D. Delorme and T.L. Payne | 1321 |
| Pheromone Reception in Tobacco Budworm Moth, Heliothis virescens T.J. Almaas and H. Mustaparta | 1331 |
| Inhibition of Larval Settlement by Natural Products from the Ascidian, Eudistoma olivaceum (Van Name) ANDREW R. DAVIS and AMY F. WRIGHT | 1349 |

| Larval Release in Brachyuran Crustaceans: Functional Similarity of Peptide Pheromone Receptor and Catalytic Site of Trypsin DAN RITTSCHOF, RICHARD B. FORWARD, JR., and BRUCE W. ERICKSON | 1359 |
|---|------|
| Effects of Soil Nitrogen Level on Ferulic Acid Inhibition of Cucumber Leaf Expansion KRISTOFER KLEIN and UDO BLUM | 1371 |
| Conversion of Verbenols to Verbenone by Yeasts Isolated from <i>Dendroctonus ponderosae</i> (Coleoptera: Scolytidae) D.W.A. HUNT and J.H. BORDEN | 1385 |
| Toxicity of Allelopathic Monoterpene Suspensions on Yeast: Dependence on Droplet Size Salvador Uribe and Antonio Peña | 1399 |
| Sex Pheromone Components of Female Smaller Tea Tortrix Moth, Adoxophyes sp. (Lepidoptera: Tortricidae) in Taiwan R. Kou, D.S. Tang, Y.S. Chow, and H.K. Tseng | 1409 |
| Hydrodynamic Constraints on Evolution of Chemically Mediated Interactions Between Aquatic Organisms in Unidirectional Flows WALTER K. DODDS | 1417 |

Volume 16, Number 5

May 1990

| Behavior and Chemical Disguise of Cuckoo Ant Leptothorax kutteri in Relation to Its Host Leptothorax acervorum | 143 |
|--|------|
| NIGEL FRANKS, MURRAY BLUM, ROY-KEITH SMITH, and ANTHONY B. ALLIES | 113 |
| Leaf Phenolic Inhibition of Gypsy Moth Nuclear Polyhedrosis Virus: Role of Polyhedral Inclusion Body Aggregation STEVEN T. KEATING, MARK D. HUNTER, and JACK C. SCHULTZ | 144: |
| Pyrrolizidine Alkaloids in an Overwintering Population of Monarch Butterflies (<i>Danaus plexippus</i>) in California M.E. STELLJES and J.N. SEIBER | 1459 |
| Identification of a Minor Component of the Sex Pheromone of Leucoptera malifoliella (Lepidoptera, Lyonetiidae) M. RIBA, J.A. ROSELL, M. EIZAGUIRRE, R. CANELA, and A. GUERRERO | 147 |
| Differences in Oxidase and Esterase Activities Involved in Pheromone Biosynthesis in Two Speices of <i>Choristoneura</i> DAVID MORSE and EDWARD A. MEIGHEN | 1485 |
| Iridoid Glycoside Metabolism and Sequestration by <i>Poladryas minuta</i> (Lepidoptera: Nymphalidae) Feeding on <i>Penstemon virgatus</i> (Scrophulariaceae) KAREN M. L'EMPEREUR and FRANK R. STERMITZ | 1495 |
| Attraction of Cacoecimorpha pronubana Male Moths to Synthetic Sex Pheromone Blends in the Wind Tunnel PETER WITZGALL | 1507 |
| Roles of Minor Components in Pheromone-Mediated Behavior of Western Spruce Budworm Male Moth J.D. Sweeney, J.A. McLean, and L.M. Friskie | 1517 |
| Effect of Sex-Pheromone Concentration on Behavior of Three Strains of Western Spruce Budworm Male Moths J.D. Sweeney and J.A. McLean | 1531 |
| Effect of Trichome B Exudate of Solanum berthaultii Hawkes on Consumption by the Colorado Potato Beetle, Leptinotarsa decemlineata (Say) YVAN PELLETIER and ZANE SMILOWITZ | 1547 |
| Relation of Spodoptera eridania Choice to Tannins and Protein of Lotus corniculatus MICHELLE A. BRIGGS | 1557 |
| Influence of Tobacco Leaf Surface Chemicals on Germination of <i>Peronospora tabacina</i> Adam Sporangia M.L. Menetrez, H.W. Spurr, Jr., D.A. Danehower, and D.R. Lawson | 1565 |
| How Contact Foraging Experiences Affect Preferences for Host-Related Odors in the Larval Parasitoid Cotesia marginiventris (Cresson) (Hymenoptera: Braconidae) TED C.J. TURLINGS, J.W.A. SCHEEPMAKER, L.E.M. VET, J.H. TUMLINSON, and W.J. LEWIS | 1577 |

| by Analogs M. SCHWARZ, J.A. KLUN, and E.C. UEBEL | 1591 |
|---|------|
| Trichethecene Mycotoxins Produced by Fusarium sporotrichioides DAOM 197255 and | |
| Their Effects on Spruce Budworm, Choristoneura fumiferana Douglas B. Strongman, George M. Strunz, and Chao-Mei Yu | 1605 |
| Pheromone Variation Among Eastern European and a Western Asian Population of the Turnip Moth, Agrotis segetum BILL S. HANSSON, MIKLÓS TÓTH, CHRISTER LÖFSTEDT, GÁBOR SZÖCS, MITKO SUBCHEV, and JAN LÖFQVIST | 1611 |
| Seasonal Changes of Furanocoumarin Concentrations in Leaves of <i>Heracleum lanatum</i> ALICIA M. ZOBEL and STEWART A. BROWN | 1623 |
| Cuticular Hydrocarbons of Four Populations of Coptotermes formosanus Shiraki in the United States: Similarities and Origins of Introductions MICHAEL I. HAVERTY, LORI J. NELSON, and MARION PAGE | 1635 |
| Does the Imported Cabbageworm, <i>Pieris rapae</i> , Use an Oviposition Deterring Pheromone? L.M. SCHOONHOVEN, E.A.M. BEERLING, R. BRAAKSMA, and Y. VAN VUGT | 1649 |
| Oviposition Stimulants in the Coccoid Cuticular Waxes of Aphytis yanonensis De Bach & Rosen SHOZO TAKAHASHI, MAKITA HAJIKA, JUNJI TAKABAYASHI, and MASAO FUKUI | 1657 |
| Rearing Rats in a Germ-Free Environment Eliminates Their Odors of Individuality PRIM B. SINGH, JEFF HERBERT, BRUCE ROSER, LINDSEY ARNOTT, DAVID K. TUCKER, and RICHARD E. BROWN | 1667 |
| Effect of Fungal Metabolite Peramine and Analogs on Feeding and Development of Argentine Stem Weevil (<i>Listronotus bonariensis</i>) DARYL D. ROWAN, JENNY J. DYMOCK, and MARGERET A. BRIMBLE | 1683 |
| Ingestion of Tall Larkspur by Cattle: Separating Effects of Flavor from Postingestive Consequences J.A. PFISTER, F.D. PROVENZA, and G.D. MANNERS | 1697 |
| Isolation and Characterization of Phytotoxic Compounds from Asparagus (Asparagus officinalis L.) Roots A.C. Hartung, M.G. Nair, and A.R. Putnam | 1707 |
| Allelochemicals in Foliage of Unfavored Tree Hosts of the Gypsy Moth, Lymantria dispar L. 1. Alkaloids and Other Components of Liriodendron tulipifera L. (Magnoliaceae), Acer rubrum L. (Aceraceae), and Cornus florida L. | |
| (Cornaceae) Pedro Barbosa, Paul Gross, Gordon J. Provan, Diane Y. Pacheco, and Frank R. Stermitz | 1719 |
| Allelochemicals in Foliage of Unfavored Tree Hosts of the Gypsy Moth, <i>Lymantria dispar</i> L. 2. Seasonal Variation of Saponins in <i>Ilex opaca</i> and Identification of Saponin Aglycones | 1731 |
| PEDRO BARBOSA, PAUL GROSS, GORDON J. PROVAN, and FRANK R. STERMITZ | |
| LETTER TO THE EDITOR Bacterial Degradation of Juglone: Evidence Against Allelopathy? G. Bruce Williamson and Jeffrey D. Weidenhamer | 1739 |

Volume 16, Number 6

June 1990

| Pathway from Methylthio to Propylthio Compounds JACQUES AUGER, CHANTAL LECOMTE, and ERIC THIBOUT | 1743 |
|--|------|
| Susceptibility of <i>Heliothis zea</i> (Boddie) Larvae to <i>Nomuraea rileyi</i> (Farlow) Samson: Effects of α-Tomatine at the Third Trophic Level F. GALLARDO, D.J. BOETHEL, J.R. FUXA, and A. RICHTER | 1751 |
| Perfluorinated Moth Pheromones: Synthesis and Electrophysiological Activity GLENN D. PRESTWICH, WEI-CHUAN SUN, M.S. MAYER, and JOSEPH C. DICKENS | 1761 |
| Convenient Synthesis of Mosquito Oviposition Pheromone and a Highly Fluorinated Analog Retaining Biological Activity GLENN W. DAWSON, ALAN MUDD, JOHN A. PICKETT, MARY M. PILE, and LESTER J. WADHAMS | 1779 |
| Neotropical Ant Gardens. 1. Chemical Constituents J.L. SEIDEL, W.W. EPSTEIN, and D.W. DAVIDSON | 1791 |
| Ovipositional Response of Three <i>Heliothis</i> Species (Lepidoptera: Noctuidae) to Allelochemicals from Cultivated and Wild Host Plants E.R. MITCHELL, F.C. TINGLE, and R.R. HEATH | 1817 |
| Children's Sensitivity to Odor of Trimethylamine EGIL H. SOLBU, FINN KONOW JELLESTAD, and KNUT OLAV STRÆTKVERN | 1829 |
| Surface Lipids of the Social Wasp <i>Polistes annularis</i> (L.) and Its Nest and Nest Pedicel KARL E. ESPELIE and HENRY R. HERMANN | 1841 |
| Importance of Quinolizidine Alkaloids in the Relationship Between Larvae of <i>Uresiphita reversalis</i> (Lepidoptera: Pyralidae) and a Host Plant, <i>Genista monspessulana</i> C.B. Montllor, E.A. Bernays, and R.V. Barbehenn | 1853 |
| Plant Growth Regulatory Activities of Artemisinin and Its Related Compounds PETER K. CHEN and GERALD R. LEATHER | 1867 |
| Change in Mandibular and Mesosomal Gland Contents of Male Xylocopa micans (Hymenoptera: Anthophoridae) Associated with Mating System H.J. McAuslane, S.B. Vinson, and H.J. Williams | 1877 |
| Electrophysiological and Chemical Analysis of Sex Pheromone Communication System of the Mottled Umber, <i>Erannis defoliaria</i> (Lepidoptera: Geometridae) BILL S. HANSSON, GABOR SZÖCS, FRANK SCHMIDT, WITTKO FRANCKE, CHRISTER LÖFSTEDT, and MIKLOS TÓTH | 1887 |
| Honeydew Analysis for Detecting Phloem Transport of Plant Natural Products: Implications for Host-Plant Resistance to Sap-Sucking Insects RUSSELL J. MOLYNEUX, BRUCE C. CAMPBELL, and DAVID L. DREYER | 1899 |

| Utilization in <i>Peridroma saucia</i> Opender Koul, Michael J. Smirle, and Murray B. Isman | 1911 |
|---|------|
| Enantiomeric Synthesis of Dominicalure, Aggregation Pheromone of Lesser Grain Borer, *Rhyzopertha dominica* (F.) LIU LIN-YU and LIN GUO-QIANG | 1921 |
| Devil's-Claw (Proboscidea louisianica) Essential Oil and Its Components: Potential Allelochemical Agents on Cotton and Wheat MICHAEL S. RIFFLE, GEORGE R. WALLER, DON S. MURRAY, and RICHARD P. SGARAMELLO | 1927 |
| Winter Chemical Defense of Alaskan Balsam Poplar Against Snowshoe Hares P.B. REICHARDT, J.P. BRYANT, B.R. MATTES, T.P. CLAUSEN, F.S. CHAPIN III, and M. MEYER | 1941 |
| Germacrone Defends Labrador Tea from Browsing by Snowshoe Hares P.B. REICHARDT, J.P. BRYANT, B.J. ANDERSON, D. PHILLIPS, T.P. CLAUSEN, M. MEYER, and K. FRISBY | 1961 |
| Upwind Searching for an Odor Plume Is Sometimes Optimal DAVID B. DUSENBERY | 1971 |
| Roles of Amino Acids, Protein, and Fiber in Leaf-Feeding Resistance of Corn to the Fall Armyworm PAUL A. HEDIN, W. PAUL WILLIAMS, FRANK M. DAVIS, and PAUL M. BUCKLEY | 1977 |
| A New Component of the Female Sex Pheromone of <i>Blattella germanica</i> (L.) (Dictyoptera: Blattellidae) and Interaction with Other Pheromone Components COBY SCHAL, EDINA L. BURNS, RUSSELL A. JURENKA, and GARY J. BLOMQUIST | 1997 |
| An Allelochemical Elicits Arrestment in <i>Apanteles kariyai</i> in Feces of Nonhost Larvae **Acantholeucania loreyi* **JUNJI TAKABAYASHI and SHOZO TAKAHASHI** | 2009 |
| Reduction of Rodent Fertility by Plant Consumption: With Particular Reference to Ziziphus spina-christi Zvia Shappira, Joseph Terkel, Jacob Egozi, Avraham Nyska, and Jacob Friedman | 2019 |
| Responses of Laboratory-Strain Mexican Fruit Flies, Anastrepha ludens, to Combinations of Fermenting Fruit Odor and Male-Produced Pheromone in Laboratory Bioassays D.C. ROBACKER and J.A. GARCIA | 2027 |
| Evidence for Allelopathy by Tree-of-Heaven Ailanthus altissima ROD M. HEISEY | 2039 |
| New Components in Defensive Secretion of the Striped Skunk, Mephitis mephitis WILLIAM F. WOOD | 2057 |
| Geranyllinalool (Diterpene Alcohol): An Insecticidal Component of Pine Wood and Termites (Isoptera: Rhinotermitidae) in Four European Ecosystems MICHÈLE LEMAIRE, PATRICIA NAGNAN, JEAN-LUC CLEMENT, CATHERINE LANGE, LAURENT PERU, and JEAN-JACQUES BASSELIER | 2067 |
| Further Studies Concerning Chemoattraction Among Fry of Arctic Charr [Salvelinus alpinus (L.)] to Water Conditioned by Conspecifics HÅKAN OLSÉN | 2081 |
| | |

Volume 16, Number 7

July 1990

| Heart Rate B.S. GOODRICH, S. GAMBALE, PAMELA R. PENNYCUIK, and T.D. REDHEAD | 209 |
|--|------|
| Volatile Compounds from Excreta of Laboratory Mice (Mus musculus): Preliminary Examination of Composition and Effects on Behavior B.S. GOODRICH, S. GAMBALE, PAMELA R. PENNYCUIK, and T.D. REDHEAD | 210 |
| Interaction Between Visual and Olfactory Stimuli During Host-Finding by Leafhopper, Dalbulus maidis (Homoptera: Cicadellidae) J.L. Todd, P.L. Phelan, and L.R. Nault | 212 |
| Chemistry of Male Mandibular Gland Secretions of <i>Philanthus triangulum</i> J.O. SCHMIDT, C.A. McDANIEL, and R.T. SIMON THOMAS | 213: |
| Allelopathic Potential of Compounds Isolated from <i>Ipomoea tricolor</i> Cav. (Convolvulaceae) A.L. Anaya, M.R. Calera-Medina, R. Mata, and R. Pereda-Miranda | 2145 |
| (3Z,6Z,9Z)-Nonadecatriene and Enantiomers of (3Z,9Z)-cis-6,7-Epoxy-Nonadecadiene as Sex Attractants for Two Geometrid and One Noctuid Moth Species J.G. MILLAR, M. GIBLIN, D. BARTON, and E.W. UNDERHILL | 2153 |
| Chemical Analysis of Temporal Gland Secretions Collected from an Asian Bull Elephant During a Four-Month Musth Episode Lois E.L. Rasmussen, David L. Hess, and Jay D. Haight | 2167 |
| Allelopathic and Autotoxic Effects of Anastatica hierochuntica L. AHMAD K. HEGAZY, KARIMA S. MANSOUR, and NAGWAN F. ABDEL-HADY | 2183 |
| Male Sternal Pheromone Glands in Acanthosomatid Shield Bugs from Britain BRIAN W. STADDON | 2195 |
| Chemical Marker from Silk of Yponomeuta cagnagellus PETER ROESSINGH | 2203 |
| nternest Aggression and Identification of Possible Nestmate Discrimination Pheromones in Polygynous Ant <i>Formica montana</i> Gregg Henderson, John F. Andersen, Joel K. Phillips, and Robert L. Jeanne | 2217 |
| Surface Lipids of Social Wasp Polistes metricus Say and Its Nest and Nest Pedicel and Their Relation to Nestmate Recognition KARL E. ESPELIE, JOHN W. WENZEL, and GEORGE CHANG | 2229 |
| Exocrine Secretions of the Andromeda Lace Bug Stephanitis takeyai (Hemiptera: Tingidae) JAMES E. OLIVER, WILLIAM R. LUSBY, and JOHN W. NEAL, JR. | 2243 |
| | |

| Effect of Diacetyl Piquerol on H*-ATPase Activity of Microsomes from <i>Ipomoea</i> purpurea | 2253 |
|--|------|
| R. CRUZ ORTEGA, A.L. ANAYA, M. GAVILANES-RUIZ, S. SANCHEZ NIETO, and M. JIMENEZ ESTRADA | |
| Source and Nature of Disturbance-Chemical System in Crayfish BRIAN A. HAZLETT | 2263 |
| Allelochemicals in Soil from No-Tillage Versus Conventional-Tillage Wheat (<i>Triticum aestivum</i>) Fields K.G. Cast, J.K. McPherson, A. J. Pollard, E.G. Krenzer, Jr., and G.R. Waller | 2277 |
| Effect of Steam Distillate Extracts of Selected Resistant Cultivated and Wild Rices on Behavior of Leaffolder Cnaphalocrocis medinalis (Guenée) (Lepidoptera: Pyralidae) R. Velusamy, B. Thayumanavan, and S. Sadasivam | 2291 |
| Growth Inhibition of Musca domestica L. and Culex quinquefasciatus (Say) by (-)-3-Epicaryoptin Isolated from Leaves of Clerodendron inerme (Gaertn) (Verbenaceae) JOHN PEREIRA and K.N. GURUDUTT | 2297 |
| 3Z,6Z,9Z-Trienes and Unsaturated Epoxides as Sex Attractants for Geometrid Moths J.G. MILLAR, M. GIBLIN, D. BARTON, and E.W. UNDERHILL | 2307 |
| Synthesis and Field Testing of Enantiomers of 6Z,9Z-cis-3,4-Epoxydienes as Sex Attractants for Geometrid Moths: Interactions of Enantiomers and Regioisomers J.G. MILLAR, M. GIBLIN, D. BARTON, A. MORRISON, and E.W. UNDERHILL | 2317 |
| Sexual Behavior of <i>Matsucoccus josephi</i> (Homoptera: Margarodidae): Asynchronous Adult Male Emergence and Release of Female Sex Pheromone ZVI MENDEL, EZRA DUNKELBLUM, and DANIEL ROBISON | 2341 |
| Characterization, Synthesis, and Behavioral Responses to Sex Attractiveness Pheromones of Red-Sided Garter Snakes (<i>Thamnophis sirtalis parietalis</i>) ROBERT T. MASON, TAPPEY H. JONES, HENRY M. FALES, LEWIS K. PANNELL, and DAVID CREWS | 2353 |
| | |

Volume 16, Number 8

August 1990

| (Nematoda: Heteroderidae) Males JENS AUMANN, CLAUS D. CLEMENS, and URS WYSS | 2371 |
|--|------|
| Ecological Implications of Condensed Tannin Structure: A Case Study T.P. CLAUSEN, F.D. PROVENZA, E.A. BURRITT, P.B. REICHARDT, and J.P. BRYANT | 2381 |
| Development of Pheromone Lure for Monitoring Field Populations of Eoreuma loftini (Lepidoptera: Pyralidae) TED N. SHAVER, HAROLD E. BROWN, and D.E. HENDRICKS | 2393 |
| Cinnamyl Derivatives and Monoterpenoids as Nonspecific Ovipositional Deterrents of the Onion Fly R.S. Cowles, J.R. Miller, R.M. Hollingworth, M.T. Abdel-Aal, F. Szurdoki, K. Bauer, and G. Matolcsy | 2401 |
| Effects of Ferulic Acid, an Allelopathic Compound, on Net P, K, and Water Uptake by Cucumber Seedlings in a Split-Root System SEUNG-WON LYU and UDO BLUM | 2429 |
| Surface Hydrocarbon Components of Two Species of Nasutitermes from Trinidad Michael I. Haverty, Barbara L. Thorne, and Marion Page | 2441 |
| Defense of Parsnip Webworm Against Phototoxic Furanocoumarins: Role of Antioxidant Enzymes KEYWAN LEE and MAY R. BERENBAUM | 2451 |
| Sex Pheromone of a <i>Planotortrix excessana</i> Sibling Species and Reinvestigation of Related Species S.P. Foster, J.R. Clearwater, S.J. Muggleston, and P.W. Shaw | 2461 |
| Chemical Studies of Rectal Gland Secretions of Some Species of Bactrocera dorsalis Complex of Fruit Flies (Diptera: Tephritidae) M.V. Perkins, M.T. Fletcher, W. Kitching, R.A.I. Drew, and C.J. Moore | 2475 |
| Letter to the Editor: De Geer's Pioneering Phytochemical Observation THOMAS EISNER | 2489 |
| Sampling Range of Male Sweetpotato Weevils (Cylas formicarius elegantulus) (Summers) (Coleoptera: Curculionidae) to Pheromone Traps: Influence of Pheromone Dosage and Lure Age L.J. MASON, R.K. JANSSON, and R.R. HEATH | 2493 |
| Interference in Determination of Rubidium and Cesium in Fish and Zooplankton by Graphite Furnace Atomic Absorption Spectrometry A.G. CHIASSON | 2503 |

| Antifeedant Activity Against Spodoptera litura Larvae and [13C]NMR Spectral Assignments of the Meliatoxins JOHN K. MACLEOD, PETER D.R. MOELLER, TADEUSZ F. MOLINSKI, and OPENDER KOUL | 2511 |
|--|------|
| β-Phellandrene: Kairomone for Pine Engraver, <i>Ips pini</i> (Say) (Coleoptera: Scolytidae) DANIEL R. MILLER and JOHN H. BORDEN | 2519 |
| Effects of Protein and Juglone on Gypsy Moths: Growth Performance and Detoxification Enzyme Activity RICHARD L. LINDROTH, BLAKE D. ANSON, and ANNE V. WEISBROD | 2533 |
| Evidence for Trail-Pheromone Precursor in Termite Reticulitermes speratus (Kolbe) (Rhinotermitidae: Isoptera) M. TOKORO, R. YAMAOKA, K. HAYASHIYA, M. TAKAHASHI, and K. NISHIMOTO | 2549 |
| Effects of Mixtures of Phenolic Acids on Phosphorus Uptake by Cucumber Seedlings Seung-Won Lyu, Udo Blum, Thomas M. Gerig, and Timothy E. O'Brien | 2559 |
| Preference of Meadow Voles (<i>Microtus pennsylvanicus</i>) for Conifer Seedlings: Chemical Components and Nutritional Quality of Bark of Damaged and Undamaged Trees JEAN-D. BUCYANAYANDI, JEAN-MARIE BERGERON, and HUGUES MENARD | 2569 |
| Structure of a Novel Phytoecdysteroid, Vitexirone, and Efficient Isolation of Phytoecdysteroids from Vitex fisherii I. Kubo, Y. Asaka, M.J. Stout, and T. Nakatsu | 2581 |
| Flight and Landing Behavior of <i>Trypodendron lineatum</i> (Coleoptera: Scolytidae) in Response to Different Semiochemicals S.M. SALOM and J.A. McLean | 2589 |

Volume 16, Number 9

September 1990

| Behavioral Responses of Male Periplaneta americana L. to Female Sex Pheromone Components, Periplanone-A and Periplanone-B KENTARO OKADA, MASATAKA MORI, KAZUKO SHIMAZAKI, and TATSUJI CHUMAN | 260 |
|--|--------------|
| Identification of Sex Pheromone of Bristly Cutworm, Lacinipolia renigera (Stephens) K.F. HAYNES | 261: |
| Novel Internally Branched, Internal Alkenes as Major Components of the Cuticular Hydrocarbons of the Primitive Australian Ant Nothomyrmecia macrops Clark (Hymenoptera: Formicidae) W. Vance Brown, Pierre Jaisson, Robert W. Taylor, and Michael J. Lacey | 2 623 |
| In Vitro Algal Growth Inhibition by Phytotoxins of Typha latifolia L. G. ALIOTTA, M. DELLA GRECA, P. MONACO, G. PINTO, A. POLLIO, and L. PREVITERA | 2637 |
| Olfactory Sensitivity of Two Sympatric Species of Rice Leaf Folders (Lepidoptera: Pyralidae) to Plant Volatiles R. RAMACHANDRAN, Z.R. KHAN, P. CABALLERO, and B.O. JULIANO | 2647 |
| Chromatographic Analysis of Species Specific Odor Profiles in <i>Mastomys natalensis</i> and <i>M. coucha</i> (Rodentia: Muridae) P.J. APPS, D.H. GORDON, H.W. VILJOEN, and V. PRETORIUS | 2667 |
| Biochemical Activity of Centipedegrass Against Fall Armyworm Larvae B.R. WISEMAN, R.C. GUELDNER, R.E. LYNCH, and R.F. SEVERSON | 2677 |
| Defense Chemicals from Abdominal Glands of 13 Rove Beetle Species of Subtribe Staphylinina (Coleoptera: Staphylinidae, Staphylininae) ANGELA HUTH and KONRAD DETTNER | 2691 |
| Comparison of Techniques for Extracting Volatile Compounds from Conifer Needles RM. MUZIKA, C.L. CAMPBELL, J.W. HANOVER, and A.L. SMITH | 2713 |
| Chemical Ecology of Canarian Laurel Forest: Toxic Diterpenes from Persea indica (Lauraceae) AZUCENA GONZALEZ-COLOMA, MELCHOR G. HERNANDEZ, AUREA PERALES, and BRAULIO M. FRAGA | 2723 |
| Glucosinolate Levels in Cotyledons of Mustard, Brassica juncea L. and Rape, B. napus L. Do Not Determine Feeding Rates of Flea Beetle, Phyllotreta cruciferae (Goeze) ROBERT P. BODNARYK and P. PALANISWAMY | 2735 |
| Allelopathic Inhibition of Cynodon dactylon (L.) Pers. and Other Plant Species by Euphorbia prostrata L. IBRAHIM S. ALSAADAWI, FAISAL A.K. SAKERI, and SAMEER M. AL-DULAIMY | 2747 |

| Genetic Sources of Pheromone Variation in <i>Colias eurytheme</i> Butterflies THOMAS W. SAPPINGTON and ORLEY R. TAYLOR | 2755 |
|--|------|
| Developmental and Environmental Sources of Pheromone Variation in <i>Colias eurytheme</i> Butterflies THOMAS W. SAPPINGTON and ORLEY R. TAYLOR | 2771 |
| BOOK REVIEW | 2787 |

Volume 16, Number 10

October 1990

| Attraction of Pinyon Pine Bark Beetle, <i>Ips hoppingi</i> , to Conspecific and <i>I. confusus</i> Pheromones (Coleoptera: Scolytidae) JAMES H. CANE, LAURA D. MERRILL, and DAVID L. WOOD | 279 |
|--|------|
| A Novel Attractant for Mexican Fruit Fly, <i>Anastrepha ludens</i> , from Fermented Host Fruit D.C. Robacker, A.M. Tarshis Moreno, J.A. Garcia, and R.A. Flath | 279 |
| Salivary Glands and Preputial Glands of Males as Source of Estrus-Stimulating Pheromone in Female Mice A. MARCHLEWSKA-KOJ, E. POCHROŃ, and A. ŚLIWOWSKA | 281 |
| Squirting and Refilling: Dynamics of <i>p</i> -Benzoquinone Production in Defensive Glands of <i>Diploptera punctata</i> IAN T. BALDWIN, DAVID B. DUSENBERY, and THOMAS EISNER | 2823 |
| Chemical Taxonomic Studies of Cuticular Hydrocarbons in Locusts of the Schistocerca americana Complex (Acrididae: Cyrtacanthacridinae): Chemical Relationships between New World and Old World Species J.P. Grunshaw, H. Guermouche, S. Guermouche, N.D. Jago, R. Jullien, E. Knowles, and F. Perez | 2835 |
| Chemoattraction in <i>Pellioditis pellio</i> (Nematoda: Secernentia) in the Presence and Absence of Barriers L.K. EVELAND and B. FRIED | 2859 |
| Caste-Dependent Reactions to Soldier Defensive Secretion and Chiral Alarm/Recruitment Pheromone in Nasutitermes princeps YVES ROISIN, C. EVERAERTS, J.M. PASTEELS, and O. BONNARD | 2865 |
| Conformational Analysis of Serricornin: Application of Molecular Mechanics Calculations to Stereochemical Assignment of Serricornin, Sex Pheromone of Cigarette Beetle (Lasioderma serricorne F.) Tatsuji Chuman, Kazuko Shimazaki, Masataka Mori, Kentaro Okada, Hitoshi Gotō, Eiji Ōsawa, Kazuhisa Sakakibara, and Minoru Hirota | 2877 |
| Preferences of Mated Heliothis virescens and H. subflexa Females for Host and Nonhost Volatiles in a Flight Tunnel F.C. TINGLE, E.R. MITCHELL, and R.R. HEATH | 2889 |
| educin, Male Sex Pheromone of the Cockroach Nauphoeta cinerea: Isolation, Identification, and Bioassay LEAM SRENG | 2899 |
| he Protective Effect of Antioxidants to a Phototoxin-Sensitive Insect Herbivore, Manduca sexta R.R. AUCOIN, P. FIELDS, M.A. LEWIS, B.J.R. PHILOGÈNE, and J.T. ARNASON | 2913 |

| Variation in Tannin Activity of Acorns of Seven Species of Central Florida Oaks DAVID C. FLECK and JAMES N. LAYNE | 2925 |
|---|------|
| Genetic Aspects of Interpopulational Differences in Pheromone Blend of Cabbage Looper Moth, <i>Trichoplusia ni</i> RANDY E. HUNT, BO-GUANG ZHAO, and KENNETH F. HAYNES | 2935 |
| Responses by Domestic Cats (Felis catus) to Snake Scent Gland Secretions JEANNIE WRIGHT and PAUL J. WELDON | 2947 |
| Urinary Chemosignals, Reproduction, and Population Size for House Mice (Mus domesticus) Living in Field Enclosures LEE C. DRICKAMER and DAVID G. MIKESIC | 2955 |
| Electroantennographic Responses Differentiate Sibling Species of Dingy Cutworm Complex, Feltia jaculifera (GN.) (Lepidoptera: Noctuidae) J.R. Byers, D.L. Struble, C.E. Herle, G.C. Kozub, and J.D. Lafontaine | 2969 |
| Identification of Sex Pheromones of Two Sibling Species in Dingy Cutworm Complex, Feltia jaculifera (GN.) (Lepidoptera: Noctuidae) J.R. Byers and D.L. Struble | 2981 |
| Neotropical Ant Gardens II. Bioassays of Seed Compounds D.W. DAVIDSON, J.L. SEIDEL, and W.W. EPSTEIN | 2993 |

Volume 16, Number 11

November 1990

CONTENTS

Special Issue: Proceedings of the Symposium on Semiochemicals and Pest Control—Prospects for New Applications

| EDITORS' NOTE | 301 |
|---|------|
| FOREWORD | 301 |
| Aphid Semiochemicals—A Review, and Recent Advances on the Sex Pheromone G.W. Dawson, D.C. Griffiths, L.A. Merritt, A. Mudd, J.A. Pickett, L.J. Wadhams, and C.M. Woodcock | 301 |
| Present and Future Use of Semiochemicals in Pest Management of Bark Beetles J.P. VITÉ and E. BAADER | 303 |
| Host-Marking Pheromones in Lepidoptera, with Special Reference to Two <i>Pieris</i> spp. L.M. Schoonhoven | 3043 |
| Chemicals Involved in Honeybee-Sunflower Relationship M.H. Pham-Delegue, P. Etievant, E. Guichard, R. Marilleau, Ph. Douault, J. Chauffaille, and C. Masson | 3053 |
| Semiochemicals for Use with Parasitoids: Status and Future W.J. Lewis and W.R. Martin, Jr. | 3067 |
| Plant strategies of Manipulating Predator-Prey Interactions Through Allelochemicals: Prospects for Application in Pest Control MARCEL DICKE, MAURICE W. SABELIS, JUNJI TAKABAYASHI, JAN BRUIN, and MAARTEN A. POSTHUMUS | 3091 |
| Semiochemicals and Learning in Parasitoids LOUISE E.M. VET and ALEX W. GROENEWOLD | 3119 |
| Odor Learning and Foraging Success in the Parasitoid, Leptopilina heterotoma Daniel R. Papaj and Louise E.M. Vet | 3137 |
| Prospects of Antifeedant Approach to Pest Control—A Critical Review T. Jermy | 3151 |
| Behavioral and Electrophysiological Study of Antifeedant Mechanisms Associated with Polyhydroxy Alkaloids M.S.J. SIMMONDS, W.M. BLANEY, and L.E. FELLOWS | 3167 |
| Stimulo-Deterrent Diversion: A Concept and Its Possible Application to Onion Maggot Control JAMES R. MILLER and RICHARD S. COWLES | 3197 |

Volume 16, Number 12

December 1990

| Cuticular Hydrocarbons and Defensive Compounds of Reticulitermes flavipes (Kollar) and R. santonensis (Feytaud): Polymorphism and Chemotaxonomy Anne Genevieve Bagnères, Jean Luc Clément, Murray S. Blum, Ray F. Severson, Catherine Joulie, and Catherine Lange | 3213 |
|---|------|
| Replacement of Carcinogenic Solvent HMPA by DMI in Insect Sex Pheromone Synthesis CHI-CHU Lo and PEI-MIN CHAO | 3245 |
| Olfactory Response of Eastern Spruce Budworm Larvae to Red Spruce Needles Exposed to Acid Rain and Elevated Levels of Ozone WILLIAM N. CANNON, JR. | 3255 |
| A Simple Method for Analysis of Insect Cuticular Hydrocarbons Anne Genevieve Bagnères and E. David Morgan | 3263 |
| Gut Redox Conditions in Herbivorous Lepidopteran Larvae HEIDI M. APPEL and MICHAEL M. MARTIN | 3277 |
| Olfactory Discrimination Ability in Short-Tailed Fruit Bat, Carollia perspicillata (Chiroptera: Phyllostomatidae) MATTHIAS LASKA | 3291 |
| Fungal Endophyte-Infected Grasses: Alkaloid Accumulation and Aphid Response M.R. Siegel, G.C.M. Latch, L.P. Bush, F.F. Fannin, D.D. Rowan, B.A. Tapper, C.W. Bacon, and M.C. Johnson | 3301 |
| Olfactory-Based Behavioral Interactions Among Five Species in the Southern Pine Bark Beetle Group M.T. SMITH, T.L. PAYNE, and M.C. BIRCH | 3317 |
| Defensive Role of Tropical Tree Resins: Antitermitic Sesquiterpenes from Southeast Asian Dipterocarpaceae ADAM MESSER, KEVIN McCormick, Sunjaya, H.H. Hagedorn, Ferny Tumbel, and J. Meinwald | 3333 |
| Rust-Red Grain Beetle, Cryptolestes ferrugineus, and Flat Grain Beetle, Cryptolestes pusillus: Antennal and Behavioral Responses to Synthetic Components of Their Aggregation Pheromones J. CHAMBERS, C.P. MORGAN, P.R. WHITE, K. MORI, D.E. FINNEGAN, and D.B. PINNIGER | 3353 |
| Rapid, Quantitative HPLC Analysis of Asclepias fruticosa L. and Danaus plexippus L. Cardenolides HENRI W. GROENEVELD, HARKO STEIJL, BERT VAN DEN BERG, and JOPIE C. ELINGS | 3373 |
| (+)-Juniperol and (+)-Pimaral: Attractants for the Cerambycid Beetle, <i>Monochamus</i> alternatus Hope | 3383 |
| Mitsuru Sakai and Toru Yamasaki | |

| Identification and Field Testing of Female-Produced Sex Pheromone Components of the Spring Cankerworm, <i>Paleacrita vernata</i> Peck (Lepidoptera: Geometridae) J.G. MILLAR, M. GIBLIN, D. BARTON, D.A. REYNARD, G.B. NEILL, and E.W. UNDERHILL | 3393 |
|--|------|
| Analysis and Field Evaluation of Volatile Blend Emitted by Calling Virgin Females of Beet Armyworm Moth, <i>Spodoptera exigua</i> (Hübner) J.H. TUMLINSON, E.R. MITCHELL, and HS. YU | 3411 |
| Isolation of Corn Semiochemicals Attractive and Repellent to Western Corn Rootworm Larvae BRUCE E. HIBBARD and LOUIS B. BJOSTAD | 3425 |
| Allelochemical Regulation of Reproduction and Seed Germination of Two Brazilian Baccharis Species by Phytotoxic Trichothecenes JOSEPH O. KUTI, BRUCE B. JARVIS, NAHID MOKHTARI-REJALI, and GEORGE A. BEAN | 3441 |
| Sex Attractant Pheromone of Damson-Hop Aphid Phorodon humuli (Homoptera, Aphididae) C.A.M. CAMPBELL, G.W. DAWSON, D.C. GRIFFITHS, J. PETTERSSON, J.A. PICKETT, L.J. WADHAMS, and C.M. WOODCOCK | 3455 |
| Characterization of Pedicel, Paper, and Larval Silk from Nest of <i>Polistes annularis</i> (L.) KARL E. ESPELIE and DAVID S. HIMMELSBACH | 3467 |
| Multispecies Trapping of Helicoverpa (Heliothis) zea, Spodoptera frugiperda, Pseudaletia unipuncta, and Agrotis ipsilon (Lepidoptera: Noctuidae) J.D. LOPEZ, JR., T.N. SHAVER, and J.L. GOODENOUGH | 3479 |
| Trail Pheromone of the Ant <i>Tetramorium impurum</i> and Model Compounds: Structure-Activity Comparisons E. David Morgan, Brian D. Jackson, David G. Ollett, and Geoffrey W. Sales | 3493 |
| Male Pheromone of Swift Moth, <i>Hepialus hecta</i> L. (Lepidoptera: Hepialidae) STEFAN SCHULZ, WITTKO FRANCKE, WILFRIED A. KÖNIG, VOLKER SCHURIG, KENJI MORI, ROLF KITTMANN, and DIETRICH SCHNEIDER | 3511 |
| Effects of Urea Analogs on Egg Hatching and Movement of Unhatched Larvae of Monogenean Parasite Acanthocotyle lobianchi from Skin of Raja montagui IAN D. WHITTINGTON and GRAHAM C. KEARN | 3523 |
| Beneficial Arthropod Behavior Mediated by Airborne Semiochemicals. IX. Differential Response of <i>Trichogramma pretiosum</i> , an Egg Parasitoid of <i>Heliothis zea</i> , to Various Olfactory Cues L.P.J.J. NOLDUS, W.J. LEWIS, and J.H. TUMLINSON | 3531 |
| BOOK REVIEW E.R. MITCHELL | 3545 |
| LETTER TO THE EDITOR Ecological Implications of the Destruction of Juglone (5-hydroxy-1,4-naphthoquinone) by Soil Bacteria S.K. SCHMIDT | 3547 |
| AUTHOR INDEX TO VOLUME 16 | 3551 |
| KEY WORD INDEX TO VOLUME 16 | 3559 |